APPENDIX B

FIELD SAMPLING PLAN

FIELD SAMPLING PLAN

MISCELLANEOUS SITE INVESTIGATIONS

HAMILTON ARMY AIRFIELD

NOVATO, CALIFORNIA

Final Submittal

Prepared by:

US Army Corps of Engineers ®

Sacramento District
Environmental Design Section

January 2004

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF ATTACHMENTS

ACRONYMS

ASR	Archive Search Report
COC	Chain of custody
DQOs	Data quality objectives
EDS	Environmental Design Section
FSP	Field sampling plan
GPS	Global Positioning System
HAAF	Hamilton Army Airfield
IDW	Investigation-derived waste
mg/kg	milligram/kilogram
QAPP	Quality assurance project plan
QC	Quality control
PAHs	Polynuclear aromatic hydrocarbons
SSHP	Site safety and health plan
Total DDTs	Sum of Dichlorodiphenyltrichloroethane, Dichlorodiphenyldichloroethane, and Dichlorodiphenyldichloroethylene (DDT + DDD + DDE)
USACE	U.S. Army Corps of Engineers
WP	Work Plan

FIELD SAMPLING PLAN
MISCELLANEOUS SITE INVESTIGATIONS
HAMILTON ARMY AIRFIELD

1. INTRODUCTION

1.1 SCOPE OF PROJECT

This Field Sampling Plan (FSP) describes the work to be performed in support of the investigation of soil at eight locations at Hamilton Army Airfield (HAAF). The Miscellaneous Site Investigations are designed to collect data that will be used to determine whether soil at the eight sites is contaminated, if soil can remain onsite or must be removed from a site because the concentrations of the chemicals of concern are too high, or if additional investigation is required.

The FSP outlines the methods of sampling and analysis of the eight areas. The US Army Corps of Engineers (USACE), Sacramento District is performing the Miscellaneous Site investigations.

1.2 SCOPE OF REPORT

This FSP presents the site investigations sampling and analysis programs, sampling objectives, sampling strategy and rationale, sampling locations, sample collection methods, and sample handling procedures. The FSP is designed to ensure that field procedures and documentation are standardized so that data collected are valid and defensible. All field personnel will become familiar with the FSP prior to conducting fieldwork.

The FSP will be implemented in conjunction with the Quality Assurance Project Plan (QAPP) and the Site Safety and Health Plan (SSHP).

1.3 SITE LOCATION

HAAF is located in Novato, CA. HAAF was a former Air Force Base and Army Airfield. The location of HAAF is shown in Figure 1-1.

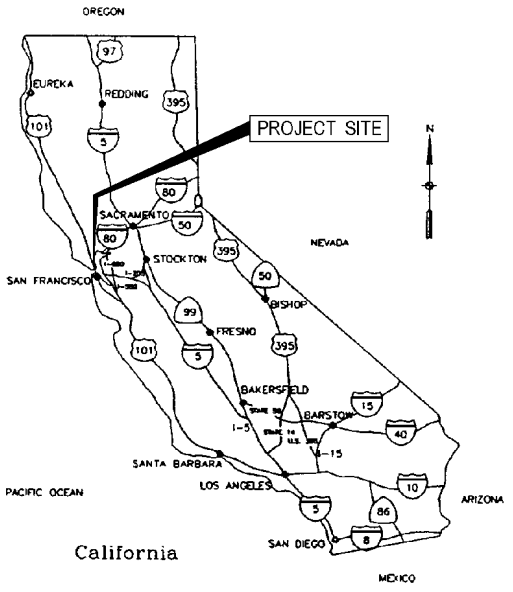

Figure 1-1: Project Location Map

1.4 MISCELLANEOUS INVESTIGATION SITES

The eight sites of the Miscellaneous Site Investigations are listed below and shown in Figure 1-2:

- Spoils Pile F;
- South of the Runway DDT Hotspot;
- Building 35;
- Unlined Perimeter Drainage Ditch
- Revetments 6 and 7;
- Firing-In Target Butt Near Revetment 1;
- Skeet Range;
- Testing Range.

1.5 PROJECT STAFFING

This study is being designed and implemented by the Environmental Design Section (EDS), Sacramento District, and USACE under the general supervision of Rick Meagher, Section Chief. The technical design team includes:

Personnel	Responsibility
Kathy Siebenmann	Technical Team Lead, Chemist
Teresa Rodgers	Field Task Leader, Geologist
Donna Maxey	Industrial Hygienist

Each team member provides an integral part in completing this Study, including preparation and implementation of the Design Quality Objectives, Work Plan (WP), performing fieldwork, and reporting.

2. SAMPLING

This section provides the sample locations, number of samples, analytical methods, and the rationale for the sampling and analytical program. Investigation and sampling techniques and procedures are discussed in Section 4.0. Overall, the investigative approach includes only soil sampling. All sampling locations will be identified using a Global Positioning System (GPS).

During the performance of fieldwork, sampling locations and depths stated in this FSP may be adjusted and additional samples added based on field observations or conditions.

Please refer to Figures 2-1 to 2-8 while reading the descriptions below.

2.1 SPOILS PILE F FOR TOTAL DDTS

Collect one surface sample south of the location of HBSFL618. Collect three surface samples along the eastern edge of the excavation area. (See Figure 2-1.) These samples shall be sent to an offsite laboratory for analysis for Total DDTs. If results indicate residual DDTs above 0.024 mg/kg, then vertical and horizontal stepout samples will be collected and analyzed. The vertical stepout shall be 1 foot and the horizontal stepout shall be five feet.

2.2 SOUTH OF THE RUNWAY DDT HOTSPOT

Collect one depth sample approximately 3 feet bgs immediately adjacent to Sample HAA-2003-SO-36 and four surface samples 25 feet away and surrounding HAA-2003-SO-36. (See Figure 2-2.) Analyze the samples for Total DDTs with an immunoassay field test kit and compare the results to both the 0.2mg/kg and 1.0mg/kg standard concentrations. If the field test kit results are greater than 1.0 mg/kg, then soil samples from stepout locations both vertically (at 6-inch intervals) and horizontally (at 25-foot intervals) shall be collected and analyzed using the field test kits. Verification samples from the extent of the Total DDTs-contaminated soil and at least one verification sample from within the DDT hotspot area shall be sent to an off-site laboratory for analysis for Total DDTs.

2.3 BUILDING 35 FOR TOTAL DDTS

Collect one sample at 5 feet bgs immediately adjacent to the previous sample B35E-CS-002 hotspot and three samples at 4.5 feet bgs spaced 5 feet from and surrounding the hotspot, two along the pipeline and the third south of the pipeline. (See Figure 2-3.) Analyze the sample for Total DDTs with an immunoassay field test kit and compare the results to both the 0.2 mg/kg

and 1.0 mg/kg standard concentrations. If the field test kit results are greater than 1.0 mg/kg, then soil samples from stepout locations both vertically (6-inch intervals) and horizontally along the pipeline (5-foot intervals) and south of the pipeline (5-foot intervals) shall be collected. Two verification samples from the extent of the Total DDTs-contaminated soil and at least one verification sample from within the high Total DDTs area shall be sent to an offsite laboratory for analysis for Total DDTs.

2.4 UNLINED PERIMETER DRAINAGE DITCH FOR TOTAL DDTS

Collect a total of fifteen samples – five samples at the curve of the ditch at the northwest corner of the panhandle (floor sample approximately 1 foot below the floor of the ditch and centered on its midline; 2 surface samples halfway up the walls on either side of the ditch; 2 bank samples will be collected 1 foot from the edge on either side of the ditch) and 2 other locations 100 feet on either side along the ditch from the initial sample location (for both, a floor sample will be collected approximately 1 foot below the floor of the ditch and centered on its midline; 2 surface samples will be collected halfway up the wall on either side of the ditch, and 2 bank samples will be collected 1 foot from the edge on either side of the ditch). See Figure 2-4. Analyze the samples for Total DDTs with an immunoassay field test kit and compare the results to both the 0.2 mg/kg and 1.0mg/kg standard concentrations. If the field test kit results are greater than 1.0 mg/kg, then sediment samples from stepout locations both vertically (6-inch intervals) and horizontally (50-foot intervals) shall be collected and analyzed using the field test kits. If the field test kit results are less than 1.0 mg/kg, then sediment samples from stepin locations horizontally (1/2 the sampling interval) shall be collected and analyzed using the field test kits. Samples from the extent of the Total DDTs-contaminated sediment (< 1 mg/kg) and at least one from within the high Total DDTs area shall be sent to an off-site laboratory for analysis for Total DDTs to verify field testing results.

2.5 REVETMENTS 6 AND 7 FOR MERCURY

Composite samples will be collected from each excavated area of differing depth from both Revetments 6 and 7 and analyzed for mercury. (See Figure 2-5a and 2-5b.) Composites will include at least 4 discrete samples from the excavation.

2.6 FIRING-IN TARGET BUTT (ASR # 19) FOR SELECTED METALS

Five soil samples will be collected immediately in front of and to the sides of the FITB and analyzed for selected metals (antimony, arsenic, cadmium, chromium, copper, lead, nickel, and zinc). Soil from four locations beneath the FITB will be collected and sifted to isolate any ammunition fragments. (See Figure 2-6 for locations.) (See Section 4.1 for sieving protocol.)

2.7 SKEET RANGE (ASR #18) FOR SELECTED METALS AND PAHS

Nine discrete samples will be collected at three distances from the firing line – one at 120 feet, two at 250 feet, three at 350 feet, and three at 500 feet. These locations are based upon estimated distances of the range of ammunition from shotguns. (See Figure 2-7.) The samples will be analyzed for metals (antimony, arsenic, cadmium, chromium, copper, lead, nickel, and zinc) and PAHs. Soil will also be collected from four locations within the range and sifted to isolate ammunition, ammunition fragments, and/or clay pigeon fragments. (See Section 4.1 for sieving protocol.)

2.8 TESTING RANGE (ASR #4)

Five samples will be collected along the inboard side of the levee, and equally spaced along the length of the Testing Range Area. (See Figure 2-8.) The soil samples will be collected from 0 to 6 inches bgs, between the toe and top of the levee, and analyzed for metals (antimony, arsenic, cadmium, chromium, copper, lead, nickel, and zinc) based upon the assumption that ammunition was tested in this area, and that the levee was used as a backstop. Soil will also be collected from five locations within the range and sifted to isolate any ammunition fragments. (See Section 4.1 for sieving protocol.)

3. SOIL SAMPLING

Soil samples will be collected at each site as shown on the sample locations maps for each site. Sample locations may be adjusted based on site conditions and accessibility. Soil samples will be collected from the sample locations at the depths shown in Table 3-1. All sampling locations will be flagged, and the coordinates will be identified using GPS equipment (see Table 4-1).

During the performance of fieldwork, sampling locations and depths stated in this FSP may be adjusted, deleted, or additional samples added, based on field observations or conditions. Any changes will be documented in both the field logbook and final reports.

The analytes were selected based on the results of previous analytical results at HAAF and potential contaminants of concern based upon site history. Soil samples will be analyzed for the following analytes:

- Metals by Method SW6010B/SW7471A
- Pesticides by Method SW8081A (offsite laboratory)
- Pesticides by Method SW4042 (field laboratory)
- PAHs by Modified Method SW8270C.

TABLE 3-1: Summary of Proposed Analytical Parameters

SAMPLE IDENTIFICATION				ANALYTE PROGRAM	
MISCELLANEOUS SITES	SAMPLE ID	SAMPLING DESIGN	CONTAINER TYPE/NUMBER	ANALYTE	METHOD
Spoils Pile F MS/MSD	HAAF-SPF-701 HAAF-SPF-702 HAAF-SPF-703 HAAF-SPF-704-MS/MSD	Collect one surface sample south of the location of HBSFL618. Collect three surface samples along the eastern edge of the excavation area. Send the samples to an offsite laboratory for analysis for Total DDTs.	4-oz clear wide mouth (CWM) jar /5	DDTs	Offsite lab; SW 8081A
South of the Runway DDT Hotspot	Characterization samples: HAAF-SRW-705-3FT HAAF-SRW-D-801-3FT HAAF-SRW-706 HAAF-SRW-707 HAAF-SRW-708 HAAF-SRW-709 Verification samples: HAAF-SRW-757-V HAAF-SRW-758-V HAAF-SRW-759-V	Collect one depth sample approximately 3 feet bgs immediately adjacent to Sample HAA-2003-SO-36 and four surface samples 25 feet away and surrounding HAA-2003-SO-36. Analyze the samples for Total DDTs with an immunoassay field test kit and compare the results to both the 0.2mg/kg and 1.0mg/kg standard concentrations. If the field test kit results are greater than 1.0 mg/kg, then soil samples from stepout locations both vertically (at 6-inch intervals) and horizontally (at 25-foot intervals) shall be collected and analyzed using the field test kits. Two verification samples from the excavated extent of the Total DDTs-contaminated soil and one verification sample from within the DDT hotspot area shall be sent to an offsite laboratory for analysis for Total DDTs.	4-oz clear wide mouth (CWM) jar /6 characterization samples; 3 verification samples	DDTs	(1) Characterization samples by Immunoassay field test kit; SW 4042 (2) Verification samples sent to offsite lab; SW 8081A
Building 35 for Total DDTs MS/MSD	Characterization samples: HAAF-B35-710-5FT HAAF-B35-711-4.5FT HAAF-B35-712-4.5FT HAAF-B35-713-4.5FT-MS/MSD Verification samples: HAAF-B35-760-V HAAF-B35-761-V HAAF-B35-762-V	Collect one depth sample at 5 feet bgs immediately adjacent to the previous sample B35E-CS-002 hotspot and three depth samples at 4.5 feet bgs spaced 5 feet from the hotspot. Two of these samples shall be placed along the pipeline and the third shall be perpendicular to the pipeline on the south side. Analyze the sample for Total DDTs with an immunoassay field test kit and compare the results to both the 0.2 mg/kg and 1.0 mg/kg standard concentrations. If the field test kit results are greater than 1.0 mg/kg, then soil samples from stepout locations both vertically (6-inch intervals) and horizontally (5-foot intervals) shall be collected.	4-oz clear wide mouth (CWM) jar /4 characterization samples; 3 verification samples	DDTs	(1) Characterization samples by Immunoassay field test kit; SW 4042 (2) Verification samples sent to offsite lab; SW 8081A

TABLE 3-1: Summary of Proposed Analytical Parameters

SAMPLE IDENTIFICATION				ANALYTE PROGRAM	
MISCELLANEOUS SITES	SAMPLE ID	SAMPLING DESIGN	CONTAINER TYPE/NUMBER	ANALYTE	METHOD
		Two verification samples from the extent of the Total DDTs-contaminated soil and one verification sample from within the proposed excavation area shall be sent to an offsite laboratory for analysis for Total DDTs.			
Unlined Perimeter Drainage Ditch for Total DDTs	Characterization Samples: HAAF-UPDD-714-1FT HAAF-UPDD-715 HAAF-UPDD-716 HAAF-UPDD-773 HAAF-UPDD-774 HAAF-UPDD-717-1FT HAAF-UPDD-718 HAAF-UPDD-D-802 HAAF-UPDD-719 HAAF-UPDD-771 HAAF-UPDD-772 HAAF-UPDD-720-1FT HAAF-UPDD-721 HAAF-UPDD-722 HAAF-UPDD-775 HAAF-UPDD-776 Verification samples: HAAF-UPDD-763-V HAAF-UPDD-764-V HAAF-UPDD-765-V	Collect a total of fifteen samples – five samples at the curve of the ditch at the northwest corner of the panhandle (floor sample approx. 1 ft below the floor of the ditch and centered on its midline; 2 surface samples halfway up the walls on either side of the ditch, 2 surface samples on bank 1 ft from edge) and 2 other locations 100 ft on either side along the ditch from the initial sample location (for both, a floor sample will be collected approximately 1 ft below the floor of the ditch and centered on its midline; 2 surface samples will be collected halfway up the wall on either side of the ditch, surface samples on bank 1 ft from edge). Analyze the samples for Total DDTs with an immunoassay field test kit compared to both the 0.2 mg/kg and 1.0mg/kg standard concentrations. If the field test kit results are greater than 1.0 mg/kg, then sediment samples from stepout locations both vertically (6-inch intervals) and horizontally (50-foot intervals) shall be collected and analyzed using the field test kits. If the field test kit results are less than 1.0 mg/kg, then sediment samples from stepin locations horizontally (1/2 the sampling interval) shall be collected and analyzed using the field test kits. Verification samples from the extent of the Total DDTs-contaminated soil (above 1 mg/kg) and at least one verification sample from within the high Total DDTs area shall be sent to an offsite laboratory for analysis for Total DDTs.	4-oz clear wide mouth (CWM) jar /16 characterization samples; 3 verification samples	DDTs	(1) Characterization samples by Immunoassay field test kit; SW 846, Method 4042 (2) Verification samples sent to offsite lab; SW 8081A
Revetment 6 for Mercury	HAAF-REV6-723	Collect two 4-point composite surface samples (one composite each from the two shallower depths excavated previously [1 ft bgs, 2 ft	4-oz clear wide mouth (CWM) jar /4	Metals (mercury)	SW7471A

TABLE 3-1: Summary of Proposed Analytical Parameters

SAMPLE IDENTIFICATION				ANALYTE PROGRAM	
MISCELLANEOUS SITES	SAMPLE ID	SAMPLING DESIGN	CONTAINER TYPE/NUMBER	ANALYTE	METHOD
	HAAF-REV6-724 HAAF-REV6-D-803 HAAF-REV6-725	bgs]) and one 10-point composite surface sample from the deepest excavation (up to 8 ft bgs).			
Revetment 7 for Mercury	HAAF-REV7-726 HAAF-REV7-727 HAAF-REV7-728	Collect three 4-point composite surface samples (one composite from each of the three depths excavated previously [1 ft bgs, 2 ft bgs, and 2.5 ft bgs]).	4-oz clear wide mouth (CWM) jar /3	Metals (mercury)	SW7471A
Firing-In Target Butt (ASR # 19)	HAAF-FITB-729 HAAF-FITB-730 HAAF-FITB-731 HAAF-FITB-732 HAAF-FITB-D-804 HAAF-FITB-733 HAAF-FITB-F-734 HAAF-FITB-F-735 HAAF-FITB-F-736 HAAF-FITB-F-737	Five discrete surface soil samples will be collected immediately in front of and to the sides of the FITB. Soil from four locations beneath the FITB will be collected and sifted to isolate any ammunition fragments.	4-oz clear wide mouth (CWM) jar /6 jars for soil analyses and 4 containers for samples to be sifted.	Metals (antimony, arsenic, cadmium, chromium, copper, lead, nickel, and zinc)	SW 6010B
Skeet Range (ASR #18) MS/MSD	HAAF-SR-738 HAAF-SR-739 HAAF-SR-740-MS/MSD HAAF-SR-741 HAAF-SR-742 HAAF-SR-766 HAAF-SR-768 HAAF-SR-769 HAAF-SR-770 HAAF-SR-F-743 HAAF-SR-F-744 HAAF-SR-F-745 HAAF-SR-F-746 HAAF-SR-F-767	Nine discrete surface samples will be collected at four distances from the firing line – one at 120 feet, two at 250 feet, three at 350 feet, and three at 500 feet. Soil will also be collected from five locations within the range and sifted to isolate ammunition and/or clay pigeon fragments.	4-oz clear wide mouth (CWM) jar /9 jars for soil analyses and 5 containers for samples to be sifted.	Metals (antimony, arsenic, cadmium, chromium, copper, lead, nickel, and zinc) PAHs	SW 6010B SW 8270C (modified)

TABLE 3-1: Summary of Proposed Analytical Parameters

SAMPLE IDENTIFICATION				ANALYTE PROGRAM	
MISCELLANEOUS SITES	SAMPLE ID	SAMPLING DESIGN	CONTAINER TYPE/NUMBER	ANALYTE	METHOD
Testing Range (ASR #4)	HAAF-TR-747 HAAF-TR-748 HAAF-TR-D-805 HAAF-TR-749 HAAF-TR-750 HAAF-TR-751 HAAF-TR-F-752 HAAF-TR-F-753 HAAF-TR-F-754 HAAF-TR-F-755 HAAF-TR-F-756	Five discrete surface samples will be collected along the inboard side of the levee, 12" – 18" into the levee and halfway between the toe and the top, and equally spaced along the length of the Testing Area. Soil will also be collected from five locations within the range and sifted to isolate ammunition fragments.	4-oz clear wide mouth (CWM) jar /6 jars for soil analyses and 5 containers for samples to be sifted.	Metals (antimony, arsenic, cadmium, chromium, copper, lead, nickel, and zinc)	SW 6010B
IDW-Water	HAAF-IDW-W-1	--	1-Liter amber glass bottle	DDTs	SW 8081A
				PAHs	SW 8702C (modified)
				Metals (antimony, arsenic, cadmium, chromium, copper, lead, nickel, and zinc)	SW 6010B

4. SAMPLING EQUIPMENT AND PROCEDURES

The field methods to be employed during the miscellaneous site investigation fieldwork performed under this FSP will be conducted in accordance with the SSHP and the QAPP, both prepared specifically for this investigation.

4.1 INVESTIGATIVE EQUIPMENT AND PROCEDURES

Sample locations will be identified with GPS equipment. Coordinates for the sample locations are listed in Table 4-1.

To collect soil samples for chemical analysis, a manual spade and scoop, stainless steel soil auger (hand or power-driven, as field conditions require), and/or pick and digging bar shall be used.

Samples at the surface (0-2 inches of undisturbed soil) will be collected at each location with the use of a manual spade and scoop. The spade and scoop will be used to remove any vegetative cover or debris.

Samples from the subsurface will be collected with the soil auger by insertion to the appropriate sample collection depth and withdrawal. Samples will be collected as close to the defined depth interval as possible (preferably within one inch) and the actual depth of the sample below the ground's surface will be recorded in the field logbook.

Composite soil samples (Revetments 6 and 7 for mercury) will consist of at least four discrete soil samples composited together. Each discrete soil sample to be used for making a composite sample shall be of approximately the same volume. The soil from the discrete samples shall be placed in a clean mixing bowl, thoroughly mixed for uniformity, and placed into a glass jar.

For samples to be collected at depth, individual soil core sections from each discrete depth horizon will be placed in a pre-cleaned stainless steel bowl, thoroughly mixed with a pre-cleaned stainless steel spoon, and placed into a glass jar.

Samples from the inboard side of the levee, Testing Range (ASR # 4), shall be collected at each of five locations. Samples will be collected between the toe and top, at a depth of 0" - 6" into the inboard levee side. Collection may be done with hand tools (soil auger, pick, digging bar, and/or stainless spoon) or backhoe, as required by field conditions. The soil shall be placed in a clean mixing bowl, thoroughly mixed for uniformity, and placed into a glass jar.

Samples to be sieved (ASRs # 4, # 18, and # 19) shall be handled in accordance with Standard Operating Procedure 1-1 (see Attachment A).

Samples collected for onsite or offsite laboratory analysis will be labeled as described in Section 5.1, sealed in Zip-loc™ bags, and placed in ice-filled coolers. Samples for onsite analysis will be delivered to the field chemist for processing as soon as possible after collection. Samples for offsite analysis will be sent to the laboratory daily via Federal Express under chain of custody, or hand-delivered.

Table 4-1: Sample Location Coordinates			
MISCELLANEOUS SITES	SAMPLE ID	Easting	Northing
Site 1: Spoils Pile F	HAAF-SPF-701	1,426,396.69	573,079.71
	HAAF-SPF-702	1,426,426.63	573,138.64
	HAAF-SPF-703	1,426,456.78	573,195.35
	HAAF-SPF-704	1,426,407.52	573,142.81
Site 2:South of the Runway DDT Hotspot	HAAF-SRW-705-3FT	1421443.63	573715.49
	HAAF-SRW-D-801-3FT	1421443.63	573715.49
	HAAF-SRW-706	1421461.41	573730.18
	HAAF-SRW-707	1421461.41	573695.39
	HAAF-SRW-708	1421425.08	573696.94
	HAAF-SRW-709	1421425.08	573728.63
	HAAF-SRW-757-V	TBD	TBD
	HAAF-SRW-758-V	TBD	TBD
	HAAF-SRW-759-V	TBD	TBD
Site 3: Building 35 for Total DDTs	HAAF-B35-710-5FT	1,426,570.79	573,462.92
	HAAF-B35-711-4.5FT	1,426,574.05	573,461.39
	HAAF-B35-712-4.5FT	1,426,568.69	573,458.71
	HAAF-B35-713-4.5FT	1,426,565.05	573,465.79
	HAAF-SRW-760-V	TBD	TBD
	HAAF-SRW-761-V	TBD	TBD
	HAAF-SRW-762-V	TBD	TBD
Site 4: Unlined Perimeter Drainage Ditch for Total DDTs	HAAF-UPDD-714-1FT	1,418,561.29	578,169.69
	HAAF-UPDD-715	1,418,569.32	578,178.03
	HAAF-UPDD-716	1,418,563.22	578,159.74
	HAAF-UPDD-773	1,418,562.63	578,185.20
	HAAF-UPDD-774	1,418,556.13	578,151.02
	HAAF-UPDD-717-1FT	1,418,467.25	578,164.26
	HAAF-UPDD-718	1,418,473.06	578,172.49
	HAAF-UPDD-D-802	1,418,473.06	578,172.49

Table 4-1: Sample Location Coordinates			
MISCELLANEOUS SITES	SAMPLE ID	Easting	Northing
	HAAF-UPDD-719	1,418,474.03	578,155.79
	HAAF-UPDD-771	1,418,467.62	578,181.93
	HAAF-UPDD-772	1,418,467.62	578,147.10
	HAAF-UPDD-720-1FT	1,418,674.28	578,142.41
	HAAF-UPDD-721	1,418,671.71	578,153.96
	HAAF-UPDD-722	1,418,666.58	578,131.83
	HAAF-UPDD-775	1,418,678.23	578,161.11
	HAAF-UPDD-776	1,418,672.64	578,124.11
	HAAF-SRW-763-V	TBD	TBD
	HAAF-SRW-764-V	TBD	TBD
	HAAF-SRW-765-V	TBD	TBD
Site 5a: Revetment 6 for Mercury	HAAF-REV6-723	1,425,899.16	573,257.47
	HAAF-REV6-724	1,425,879.30	573,236.64
	HAAF-REV6-D-803	1,425,879.30	573,236.64
	HAAF-REV6-725	1,425,917.27	573,234.20
Site 5b: Revetment 7 for Mercury	HAAF-REV7-726	1,425,559.46	573,498.56
	HAAF-REV7-727	1,425,603.97	573,560.92
	HAAF-REV7-728	1,425,630.06	573,525.14
Site 6: Firing-In Target Butt (ASR # 19)	HAAF-FITB-729	1,424,902.18	572,118.86
	HAAF-FITB-730	1,424,846.58	572,063.29
	HAAF-FITB-731	1,424,856.17	572,007.71
	HAAF-FITB-732	1,424,831.24	571,944.47
	HAAF-FITB-D-804	1,424,831.24	571,944.47
	HAAF-FITB-733	1,424,848.50	571,864.94
	HAAF-FITB-F-734	1,424,897.38	572,060.41
	HAAF-FITB-F-735	1,424,908.89	572,021.13
	HAAF-FITB-F-736	1,424,902.18	571,972.26
	HAAF-FITB-F-737	1,424,880.13	571,938.72

Table 4-1: Sample Location Coordinates			
MISCELLANEOUS SITES	SAMPLE ID	Easting	Northing
Site 7: Skeet Range (ASR #18)	HAAF-SR-738	1,424,370.01	570,346.52
	HAAF-SR-739	1,424,524.52	570,382.33
	HAAF-SR-740	1,424,680.16	570,345.40
	HAAF-SR-741	1,424,474.14	570,277.12
	HAAF-SR-742	1,424,588.35	570,273.77
	HAAF-SR-766	1,424,525.65	570,154.27
	HAAF-SR-768	1,424,325.35	570,490.05
	HAAF-SR-769	1,424,532.86	570,532.06
	HAAF-SR-770	1,424,731.62	570,486.55
	HAAF-SR-F-743	1,424,540.20	570,380.21
	HAAF-SR-F-744	1,424,387.92	570,298.39
	HAAF-SR-F-745	1,424,539.08	570,329.73
	HAAF-SR-F-746	1,424,664.49	570,296.15
	HAAF-SR-F-767	1,424,525.65	570,154.27
Site 8: Testing Range (ASR #4)	HAAF-TR-747	1,425,764.15	571,877.48
	HAAF-TR-748	1,425,829.83	572,007.89
	HAAF-TR-D-805	1,425,829.83	572,007.89
	HAAF-TR-749	1,425,900.56	572,157.98
	HAAF-TR-750	1,425,963.60	572,285.06
	HAAF-TR-751	1,426,020.67	572,398.32
	HAAF-TR-F-752	1,425,774.74	571,884.54
	HAAF-TR-F-753	1,425,842.10	572,014.03
	HAAF-TR-F-754	1,425,912.89	572,163.92
	HAAF-TR-F-755	1,425,976.39	572,291.36
	HAAF-TR-F-756	1,426,032.80	572,403.96

4.2 QUALITY CONTROL PROGRAM

The purpose of this section is to describe the field quality control (QC) samples that will be included in this project to support the data quality presented in the QAPP. The sampling methodologies, preservation techniques, and decontamination procedures described in this FSP have been selected to ensure appropriate data quality. The appropriateness of the field sampling protocol will be verified by inclusion of QC samples as described below. Specific QC duplicate samples are included in Table 3-1.

4.2.1 Field Duplicates (QC Samples)

QC duplicate samples collected in the field will provide precision information for the entire measurement system, including sample acquisition, homogeneity, handling, shipping, storage, preparation, and analysis. The field duplicates will be placed in a separate sample jar from the normal sample after homogenization of the sample in the mixing bowl. The identity of these samples will be held blind to the analysts and laboratory personnel until the data are in deliverable form. Duplicate analyses will be performed on approximately 10% of the total investigative samples for each method. QC sample locations are defined in this FSP; however, the locations may be adjusted based on information determined in the field. Odors or visual indicators may be used to assist in directing the location of QC samples to areas suspected to have the highest concentrations of the contaminants of interest. Duplicate samples will be analyzed by the laboratory for the same parameters as the primary sample (i.e., the sample that is being duplicated).

4.2.2 Matrix Spike/Matrix Spike Duplicates (MS/MSD)

A Matrix Spike (MS) is an environmental sample to which known concentrations of analytes have been added. The MS is taken through the entire analytical procedure and the recovery of the analytes is calculated. Results are expressed as percent recovery. The MS is used to evaluate the effects of the sample matrix on the accuracy of the analysis.

A Matrix Spike Duplicate (MSD) is an environmental sample that is divided into two separate aliquots, each of which is spiked with known concentrations of analytes. The spiked aliquots are processed separately and the results compared to determine the effects of the matrix on the precision and accuracy of the analysis. Additional soil sample volumes will be collected for MS/MSD analyses in accordance with the QAPP. MSD sample locations are defined in this FSP; however, the locations may be adjusted based on information determined in the field.

4.2.3 Blanks

A small sample container of water will be labeled as a temperature blank. One temperature blank will be included in each cooler. The temperature blank will be packaged and handled in the same manner as the other samples to assure that its temperature is representative of the samples in that cooler. The laboratory will use a calibrated thermometer to directly measure the temperature of this sample. The temperature reading from the temperature blank will be used to determine whether samples were stored under the appropriate thermal conditions.

4.3 EQUIPMENT DECONTAMINATION PROCEDURES

During sampling activities, appropriate decontamination measures will be taken to minimize sample contamination from sampling equipment. The decontamination procedures for sampling equipment will incorporate the washing steps outlined in Sections 4.3.1 of this FSP.

All down-hole sampling equipment (excluding disposable equipment) used in the collection of samples will be decontaminated as described in the following paragraphs. Decontamination should be executed immediately prior to equipment use. Whenever this is not possible or practical, measures will be taken to assure that contamination of clean equipment will not occur. Clean disposable gloves will be worn while decontaminating sampling equipment and tools. Clean sampling equipment will not be placed on the ground or other contaminated surfaces prior to use. All non-disposable sampling equipment will be constructed of stainless steel and/or Teflon.

Detergent and reagent grade water rinses are the first steps in the decontamination process. Deionized water will be stored in plastic containers and applied via pump sprayers or decanted directly from the storage container. The waste decontamination fluids will be collected and handled in accordance with Section 6.0.

Decontamination will consist of the following steps:

1) Wash with non-phosphate detergent;
2) Rinse with potable water;
3) Rinse with analyte-free water (type II reagent grade water or equivalent);
4) Air dry;
5) Wrap equipment completely with aluminum foil (shiny side out) and place in a plastic bag to prevent contamination if equipment is to be stored or transported.

4.4 SAMPLING CONTAINERS AND PRESERVATION

For samples to be shipped offsite, the laboratory performing the analyses will supply sample containers for this project. For samples to be analyzed onsite, the appropriate sample containers will be supplied. A complete set of sampling containers will be prepared for each sample in advance of the sampling event. Containers will be labeled with the date, time, project name, sample number, samplers initials, parameters for analysis, and preservative. A total of 54 primary samples, 14 sieve samples, 3 MS/MSD samples, 5 QC samples, 9 verification samples, and 1 IDW sample (for water) shall be collected. Temperature blanks will be used for all coolers containing samples requiring preservation at 4°C ± 2°C.

5. SAMPLING DOCUMENTATION AND HANDLING

5.1 SAMPLE NUMBERING SYSTEM

A unique identification number will be assigned to each sample. The number is typically an alphanumeric sequence or integer that serves as an acronym to identify the sample. Specific sample identification procedures will follow the strategy outlined below:

Primary Sample	HAAF - designator - XXX
Duplicate Sample	HAAF - designator - D - XXX
	or HAAF- designator - XXX - MS/MSD
Verification Sample	HAAF- designator – XXX - V
Investigation-derived Waste	HAAF- IDW - XXX

Designator	Name
SPF	Spoils Pile F
SRW	South of the Runway DDT Hotspot
REV6	Revetment 6
REV7	Revetment 7
FITB	Firing-in Target Butt
FITB-F	Ammunition Fragments (Firing-in Target Butt)
SR	Skeet Range
SR-F	Ammunition and Skeet Fragments (Skeet Range)
TR	Testing Range Area
TR-F	Ammunition Fragments (Testing Range)
B35	Building 35
UPDD	Unlined Perimeter Drainage Ditch

XXX is the sequential sample number, starting at 701. D indicates the sample is a field duplicate sample, while MS/MSD indicates a matrix spike duplicate. IDW is the designator for investigation-derived waste. The IDW sequential sample numbers shall start at 1.

5.2 SAMPLE LABELS

The identification number references information pertaining to a particular sample. It is recorded on the sample container, in the field logbook, and on the sample chain-of-custody form. Following sample collection, the sample label is completed in waterproof ink and secured to the sample container with clear tape.

Each sample collected at the site will be labeled with the following information:

- Sample identification number;
- Site name;
- Date and time of collection;
- Name of person collecting the sample;
- Analysis requested;
- Preservation;
- Any other information pertinent to the sample.

5.3 FIELD LOGBOOK

A field notebook bound with serially numbered pages will be used to record personnel on site, sample identification numbers, sampling date and time, and any significant observations or events during field activities. The project name, site location, sampling event, project leader, telephone number and address of contact office (should the book be misplaced or lost) will be listed in ink. The field notebook is intended to record events during sampling in sufficient detail to allow field personnel to reconstruct events that transpired during the project

The Sampling Team Leader, who will sign and date the notebook prior to initiation of fieldwork will maintain the field notebook. If it is necessary to transfer the logbook to alternative personnel during the course of fieldwork, the person relinquishing the logbook will sign and date the logbook at the time the logbook is transferred and the person receiving the logbook will do likewise. Crossing a line through the entry and entering the correct information will make corrections to erroneous data. The correction will be initialed and dated by the person making the entry. Unused portions of logbook pages will be crossed out, signed, and dated at the end of each workday. Logbook entries must be dated, legible, in ink, and contain accurate documentation. Language used will be objective, factual, and free of personal opinions.

Hypotheses for observed phenomena may be recorded, however, they must be clearly indicated as such and only relate to the subject observation.

The sample identification number, sample media, number of containers and laboratory analyses to be conducted are recorded with the sample identification number in the field log book and on the chain-of-custody.

The date and time of sample preparation and collection, and the personnel who conducted sampling are recorded with the sample identification number in the field logbook and on the chain-of custody form. The names of visitors and other persons on site are also recorded in the field logbook. Sampling personnel will also record the ambient weather conditions and other conditions at the sampling location that may affect sample collection, the apparent representativeness of the sample, or sample analysis in the field log book.

5.4 SAMPLE PACKAGING AND SHIPPING

Samples will be transported as soon as possible after sample collection for immunoassay field test kit analysis or offsite laboratory analysis. The following procedures are to be used when packing and transporting samples to the offsite laboratory:

- Use rigid plastic coolers;
- Tape the cooler drain closed both inside and out;
- Wrap glass containers with cushioning material;
- Package samples in individual plastic bags and place in cooler;
- Place a temperature blank in the cooler;
- Package ice in double plastic bags and place bags around, among, and on top of the samples;
- Put paperwork (chain-of-custody record, etc.) in a waterproof plastic bag and tape it to the inside lid of the cooler;
- Tape the cooler lid shut with fiber-reinforced tape;
- Place two signed custody seals on cooler, one at the front right and one at the back left of cooler;
- Attach completed shipping label to the top of cooler and ship following the carrier's instructions.

Sample coolers are typically shipped by overnight express carrier to the laboratory. A copy of the bill of lading (air bill) is to be retained and becomes part of the sample custody documentation. The offsite laboratory will be notified in advance of all shipments, preferably by telephone on the day of shipment and by advanced scheduling.

5.5 CHAIN OF CUSTODY PROCEDURES

Custody of samples must be maintained and documented from the time of sample collection to completion of the analyses. Each sample will be considered to be in the sampler's custody, and the sampler will be personally responsible for the care and custody of the samples until they are delivered to the courier service for delivery to the laboratory. A sample is considered to be under a person's custody if:

- The sample is in the person's physical possession;
- The sample is in view of the person after that person has taken possession;
- The sample is secured by that person so that no one can tamper with the sample; or
- The sample is secured by that person in an area that is restricted to authorized personnel.

All samples will be accompanied to the offsite laboratory by a chain-of-custody (COC) form. The chain-of-custody form contains the following information:

- Project name;
- Sample numbers;
- Sample collection point;
- Date and time of collection of samples (these must match the date and time recorded on the sample label);
- Sample matrix description;
- Analyses requested for each sample;
- Preservation method;
- Number and type of containers used;
- Any special handling or analysis requirements;
- Signature of person collecting the samples;
- Signature of persons involved in the chain of possession; and

- Names and telephone numbers of the project point of contacts (POCs).

The chain-of-custody record forms will be filled out with ink. Prior to packaging samples for shipment, all samples should be double checked against the chain of custody form. When the samples are transferred from one party to another, the individuals will sign, date, and note the time on the form. A separate COC will accompany each delivery of samples to the laboratory. The chain-of-custody form will be included in the cooler used for preservation and transport of the samples. The sampling personnel will retain a copy of the form.

6. INVESTIGATION-DERIVED WASTE

Expected or potential sources of investigation-derived waste (IDW) for this project include rinse water from decontamination procedures. The waste decontamination fluids will be collected during the decontamination procedures. Rinse water shall be collected in separate buckets during decontamination. All containers shall be Department of Transportation (DOT) approved. Each container shall be labeled with a potential hazardous waste label indicating date sample was collected and Contaminated Waste Water. IDW in each container shall be characterized prior to disposal. If the characterization results indicate the materials in a container are hazardous, the container shall be labeled with a Hazardous Waste Label. USACE will dispose of the small amounts of IDW in accordance with all Federal, state, and local regulations.

Personal Protective Equipment (PPE), including nitrile gloves and tyvex overalls/booties, will be handled as non-hazardous waste.

The field report will document IDW disposal.

7. REFERENCES

IT Corporation, *1998 Interim Removal Action Data Report, BRAC Property, Hamilton Army Airfield*, Final, April 2000.

IT Corporation, *1999 Interim Removal Action Data Report, BRAC Property, Hamilton Army Airfield*, Revision A, April 2000.

Main Airfield Parcel Record of Decision/Remedial Action Plan, Hamilton Army Airfield, Public Comment Final, August 2003.

Shaw Environmental, Inc., 2003, *Final Construction Report and Supplemental Construction Report for Building 41 Demolition and Soil Removal, Spoils Pile F Removal, and Revetments 6 and 7 Removal, Hamilton Army Airfield*, May 2003.

USACE, *Results of the Area-Wide DDT Site Investigation, Hamilton Wetlands Restoration Project*, Draft, May 2003.

U.S. Environmental Protection Agency (EPA), 1996, *Test Methods for Evaluating Solid Waste Physical/Chemical Methods, Third Edition*, December 1996.

U.S. Fish and Wildlife Service Biological Opinion and amending letter, August 2003 and September 2003.

ATTACHMENT A

STANDARD OPERATING PROCEDURE 1-1

FIELD SAMPLE COLLECTION: SIEVING

Standard Operating Procedure

(December 8, 2003)

Field Sample Collection: Sieving

Soil samples for sieving may be collected using a trowel, round-point shovel, or soil auger, and if necessary, sampling may be facilitated with a pick or digging bar. Sieve samples should be obtained in the following manner:

1. Place the soil from the desired sample depth in the clean, coarse sieve box. (standard 25-mm or 1"screen size).

2. Agitate the screen to facilitate the process. Collect sieved soil onto a clean piece of visqueen or into a stainless steel bowl. A plastic or wooden mallet may be used to break up dirt clods. Note: site conditions may require the screened sample be sieved through an intermediate screen size (e.g., standard 9.5-mm or 3/8") before being placed in the fine sieve box.

3. Place the coarsely sieved soil from the first box in the clean, finer sieve box (standard 14 – 1.4-mm screen size).

4. If sieving for bullets or pellets, and soil clumping prevents effective sieving, place the sieve within a 5-gallon bucket and either wash the soil through the sieve or soak the clumps prior to sieving. Containerized water will be managed as investigation-derived waste in accordance with the BRAC Miscellaneous Sampling Work Plan (December 2003).

5. Count the number and type of pellets, clay pigeon fragments, or bullets encounters and record the numbers on the field sampling log. After counting, return the fragments to the sampling location.

6. Mark the sample location using a pin flag, wooden stake, or equivalent.